IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
REQUEST FOR FILING NATIONAL PHASE OF
PCT APPLICATION UNDER 35 U.S.C. 371 AND 37 CFR 1.494 OR 1.495

To: Hon. Commissioner of Patents
        Washington, D.C. 20231

00909

TRANSMITTAL LETTER TO THE UNITED STATES   Atty Dkt: **P 277995**   /2990563US/LT/her
DESIGNED/ELECTED OFFICE (DO/EO/US)   M#   /Client Ref.

From: Pillsbury Winthrop LLP, IP Group: Date: April 9, 2001

This is a **REQUEST** for **FILING** a PCT/USA National Phase Application based on:

1. International Application	2. International Filing Date	3. Earliest Priority Date Claimed
PCT/FI00/000675	9 August 2000	10 August 1999
⇧ country code	Day MONTH Year	Day MONTH Year (use item 2 if no earlier priority)

4. Measured from the earliest priority date in item 3, this PCT/USA National Phase Application Request is being filed within:

    (a) ☒ 20 months from above item 3 date   (b) ☐ 30 months from above item 3 date,

    (c) Therefore, the due date (<u>unextendable</u>) is   April 10, 2001

5. Title of Invention <u>METHOD FOR SELECTING MODULATION DETECTOR IN RECEIVER, AND RECEIVER</u>

6. Inventor(s)   <u>HUTTUNEN, Mikko</u>

Applicant herewith submits the following under 35 U.S.C. 371 to effect filing:

7. ☒ Please immediately start national examination procedures (35 U.S.C. 371 (f)).

8. ☐ **A copy of the International Application** as filed (35 U.S.C. 371(c)(2)) is transmitted herewith (file if in <u>English</u> but, if in foreign language, file only if <u>not</u> transmitted to PTO by the International Bureau) including:

    a. ☐ Request;
    b. ☐ Abstract;
    c. _____ pgs. Spec. and Claims;
    d. _____ sheet(s) Drawing which are ☐ informal ☐ formal of size ☐ A4 ☐ 11"

9. ☒ **A copy of the International Application has been transmitted by the International Bureau.**

10. **A translation of the International Application** into English (35 U.S.C. 371(c)(2))
    a. ☒ is transmitted herewith including: (1) ☒ Request; (2) ☒ Abstract;
        (3) _9_ pgs. Spec. and Claims;
        (4) _1_ sheet(s) Drawing which are:
             ☐ informal ☒ formal of size ☒ A4 ☐ 11"
    b. ☐ is not required, as the application was filed in English.
    c. ☐ is not herewith, but <u>will be filed when required</u> by the forthcoming PTO Missing Requirements Notice per Rule 494(c) if box 4(a) is X'd or Rule 495(c) if box 4(b) is X'd.
    d. ☐ Translation verification attached (not required now).

11. ☒ Please see the attached Preliminary Amendment   JC08 Rec'd PCT/PTO 0 9 APR 2001

12. ☐ Amendments to the claims of the International Application **under PCT Article 19 (35 U.S.C. 371(c)(3)), i.e., before 18th month from first priority date above in item 3, are transmitted herewith (file only if in English) including:**

13. ☒ PCT Article 19 claim amendments (if any) have been transmitted by the International Bureau

14. ☐ Translation of the amendments to the claims **under PCT Article 19 (35 U.S.C. 371(c)(3)), i.e., of claim amendments** made before 18th month, **is attached (required by 20th month from the date in item 3 if box 4(a) above is X'd, or 30th month if box 4(b) is X'd, or else amendments will be considered canceled).**

15. **A declaration of the inventor (35 U.S.C. 371(c)(4))**
   a. ☐ is submitted herewith   ☐ Original   ☐ Facsimile/Copy
   b. ☒ is not herewith, but will be filed when required by the forthcoming PTO Missing Requirements Notice per Rule 494(c) if box 4(a) is X'd or Rule 495(c) if box 4(b) is X'd.

16. **An International Search Report (ISR):**
   a. Was prepared by   ☐ European Patent Office   ☐ Japanese Patent Office   ☒ Other
   b. ☒ has been transmitted by the international Bureau to PTO.
   c. ☒ copy herewith (1 pg(s).)   ☒ plus Annex of family members (1 pg(s).).

17. **International Preliminary Examination Report (IPER):**
   a. ☒ has been transmitted (if this letter is filed after 28 months from date in item 3) in English by the International Bureau with Annexes (if any) in original language.
   b. ☐ copy herewith in English.
   c.1 ☐ IPER Annex(es) in original language ("Annexes" are amendments made to claims/spec/drawings during Examination) including attached amended:
   c.2 ☐ Specification/claim pages #_____ claims #_____
      Dwg Sheets #
   d. ☐ Translation of Annex(es) to IPER   **(required by 30th month due date, or else annexed amendments will be considered canceled).**

18. **Information Disclosure Statement** including:
   a. ☒ Attached Form PTO-1449 listing documents
   b. ☒ Attached copies of documents listed on Form PTO-1449
   c. ☒ A concise explanation of relevance of ISR references is given in the ISR.

19. ☐ **Assignment** document and Cover Sheet for recording are attached. Please mail the recorded assignment document back to the person whose signature, name and address appear at the end of this letter.

20. ☐ Copy of Power to IA agent.

21. ☐ **Drawings** (complete only if 8d or 10a(4) not completed): ___ sheet(s) per set: ☐ 1 set informal; ☐ Formal of size ☐ A4 ☐ 11"

22. Small Entity Status   ☒ is **Not** claimed   ☐ is claimed (**pre-filing confirmation required**)
22(a) _____ (No.) Small Entity Statement(s) enclosed (since 9/8/00 Small Entity Statements(s) not essential to make claim)

23. **Priority** is hereby claimed under 35 U.S.C. 119/365 based on the priority claim and the certified copy, both filed in the International Application during the international stage based on the filing in (country) FINLAND of:

	Application No.	Filing Date		Application No.	Filing Date
(1)	19991696	August 10, 1999	(2)		
(3)			(4)		
(5)			(6)		

   a. ☒ See Form PCT/IB/304 sent to US/DO with copy of priority documents. If copy has not been received, please proceed promptly to obtain same from the IB.
   b. ☐ Copy of Form PCT/IB/304 attached.

RE: USA National Phase Filing of PCT/FI00/00675

JC08 Rec'd PCT/PTO   0 9 APR 2001

24.   Attached:

25   Per Item 17.c2, **cancel original** pages #_____, claims #_____, Drawing Sheets #

26.   **Calculation of the U.S. National Fee (35 U.S.C. 371 (c)(1)) and other fees is as follows:**
Based on <u>amended</u> claim(s) per above item(s) ☐ 12, ☐ 14, ☐ 17, ☐ 25 (hilite)

Total Effective Claims	minus 20 =	x $18/$9 = $0		966/967
Independent Claims	minus 3 =	x $80/$40 = $0		964/965
If any proper (ignore improper) Multiple Dependent claim is present,		add$270/$135 +0		968/969

BASIC NATIONAL FEE (37 CFR 1.492(a)(1)-(4)): ➔➔ BASIC FEE REQUIRED, <u>NOW</u> ➔➔➔➔ ↓

A.   If country code letters in item 1 are **not** "US","BR","BB","TT","MX","IL" "NZ", "IN" or "ZA"   ↓

See item 16 re: ↓
1.   Search Report was <u>not prepared by EPO or JPO</u> - - - - - - - - -   add$1000/$500   960/961
2.   Search Report was prepared by EPO or JPO - - - - - - - - - - - -   add$860/$430   +1000   970/971

SKIP B, C, D AND E UNLESS country code letters in item 1 are "US","BR","BB","TT","MX","IL", "NZ", "IN" or "ZA"   ↓

➔ ☐ B.   If <u>USPTO</u> did not issue <u>both</u> International Search Report (ISR) <u>and</u> (if box 4(b) above is X'd) the International Examination Report (IPER), - - - - - - - - - - - - - - - - - -   add$970/$485   +0   960/961

(X)

(only)
(<u>one</u>) ➔ ☐ C.   If <u>USPTO</u> issued ISR but not IPER (or box 4(a) above is X'd), -   add$710/$355   +0   958/959
(of)

(these)
(4) ➔ ☐ D.   If <u>USPTO</u> issued IPER but IPER Sec. V boxes <u>not all</u> 3 YES, -   add$690/$345   +0   956/957
(boxes)

➔ ☐ E.   If international preliminary examination fee was paid to <u>USPTO</u> <u>and</u> Rules 492(a)(4) and 496(b) <u>satisfied</u> (IPER Sec. V <u>all</u> 3 boxes YES for <u>all</u> claims), - - - - - - - - - - - -   add $100/$50   +0   962/963

27.   **SUBTOTAL =** $1000

28.   If Assignment box 19 above is X'd, add Assignment Recording fee of - - - -$40   +0   (581)

29.   Attached is a check to cover the -   **TOTAL FEES** $1000

Our Deposit Account No. 03-3975
Our Order No.   60258 | 277995
C# | M#

00909

CHARGE STATEMENT: The Commissioner is hereby authorized to charge any fee specifically authorized hereafter, or any missing or insufficient fee(s) filed, or asserted to be filed, or which should have been filed herewith or concerning any paper filed hereafter, and which may be required under Rules 16-18 and 492 (missing or insufficient fee only) now or hereafter relative to this application and the resulting Official document under Rule 20, or credit any overpayment, to our Account/Order Nos. shown above for which purpose a duplicate copy of this sheet is attached.
This CHARGE STATEMENT <u>does not authorize</u> charge of the <u>issue fee</u> until/unless an issue fee transmittal form is filed

Pillsbury Winthrop LLP
Intellectual Property Group

By Atty: Christine H. McCarthy   Reg. No.   41844

Sig: Fax: (202) 822-0944
Atty/Sec: CHM/mhn   Tel: (202) 861-3075

NOTE: File in <u>duplicate</u> with 2 postcard receipts (PAT-103) & attachments.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re PATENT APPLICATION OF

Inventor(s): HUTTUNEN, Mikko

Filed: Herewith

Title: METHOD FOR SETECTING MODULATION DETECTOR IN RECEIVER, AND RECEIVER

April 9, 2001

PRELIMINARY AMENDMENT

Hon. Commissioner of Patents
Washington, D.C. 20231

Sir:

Please amend this application as follows:

IN THE SPECIFICATION:

At the top of the first page, just under the title, insert

☒   --This application is the National Phase of International Application PCT/FI00/000675 filed August 9, 2000 which designated the U.S.
and that International Application

☒ was   ☐ was not   published under PCT Article 21(2) in English.--

Respectfully submitted,

PILLSBURY WINTHROP LLP
Intellectual Property Group

By:_____
Attorney: Christine H. McCarthy
Reg. No: 41844
Tel. No.: (202) 861-3075
Fax No.: (202) 844-0944

Atty\Sec. CHM/mhn
1100 New York Avenue, NW
Ninth Floor
Washington, DC 20005-3918
(202) 861-3000

METHOD FOR SELECTING MODULATION DETECTOR IN RECEIVER, AND RECEIVER

BACKGROUND OF THE INVENTION

The invention relates to a method for selecting a modulation detec-
5   tor in a receiver.

When information is transferred over a radio channel, a signal to be transmitted must be modulated. The purpose of modulation is to render the signal such that it can be transmitted at a radio frequency. One requirement of a good modulation method is, for example, that it enables the largest possible
10   amount of information to be transferred on the narrowest possible frequency band. Depending on the use, other features can also be stressed. In addition, modulation must be such that it causes as little interference to a neighbouring channel as possible.

One modulation method is $\pi/4$-DQPSK ($\pi/4$-shifted, Differential
15   Quaternary Phase Shift Keying) modulation. This modulation method comprises eight phase states but only four phase shifts. The allowed phase shifts (symbols) are $\pm\pi/4$ and $\pm3\pi/4$. Each phase shift corresponds to two bits to be transmitted. In other words, a digital signal modulates a carrier in two-bit sequences in such a manner that a given phase shift corresponds to each two-
20   bit combination during each symbol sequence. A symbol sequence refers here to a signal sequence which is used for transmitting two bits. The phase shifts which correspond to bit combinations 00, 01, 10 and 11 are $\pi/4$, $3\pi/4$, $-\pi/4$ and $-3\pi/4$. For example, the symbol frequency employed by the Terrestrial Trunked Radio (TETRA) is 18 kHz, whereby the bit frequency is 36 kHz.

25   When a signal is received, it has to be demodulated, i.e. the bits that are modulated to the signal have to be detected by a detector in order to find out the information included therein. A receiver may comprise a plurality of detectors which are optimized for various channel conditions. In some conditions, a channel equalizer may also be needed. Selection of a detector to be
30   used is generally implemented such that the detectors operate simultaneously and each produces a commensurable error-metric value, on the basis of which the detector that is best suited for the conditions can be selected.

The above-described arrangement has a drawback that as the detectors operate simultaneously, a considerable amount of computational
35   power is required for calculating the detector algorithms. In particular, a chan-

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nel equalizer that is possibly included in the detector requires heavy computational power.

BRIEF DESCRIPTION OF THE INVENTION

5   The object of the invention is thus to provide a method and equipment implementing the method such that the above drawbacks can be solved. This is achieved with a method and a receiver which are characterized by what is disclosed in the independent claims 1 and 6. The preferred embodiments of the invention are disclosed in the dependent claims.

The invention is based on the idea that a cross-correlation result
10   obtained from symbol synchronization is utilized when assessing a suitable detector type required by the conditions on a radio channel.

The method and arrangement of the invention have an advantage that the number of calculations required for the detection can be minimized in the receiver, since simultaneous operation of a plurality of detectors is not
15   needed. In particular, this is advantageous in terminal equipments having a limited computational capacity. By means of the invention, it is also possible to select the optimal detector type to suit the conditions on the radio channel.

BRIEF DESCRIPTION OF THE DRAWINGS

In the following, the invention will be described in greater detail in
20   connection with preferred embodiments, with reference to the attached drawings, wherein

Figure 1 is a block diagram of a receiver structure according to the invention; and

Figure 2 is a simplified schematic view of a frame structure in the
25   TETRA system.

DETAILED DESCRIPTION OF THE INVENTION

In the following, the invention is described in connection with the TETRA system with no intention to restrict the invention to any particular system or modulation method.

30   In the TETRA system, information bits received from a medium access layer (MAC) of a transmission path are encoded by block coding and convolution coding so as to detect errors arising in the signal on a radio path and possibly correct them at reception. The encoded bits are interleaved such that successive bits are far apart from one another. This facilitates error cor-

rection if the signal to be transmitted is exposed to instantaneous interference on the radio path. The interleaved bits are mixed by using a given colour code, by means of which the transmissions of different base stations can be identified. In multiplexing, bits of different logical channels are combined. Thereaf-

5   ter, a burst is formed from the multiplexed bits. A burst is a structure which is transmitted in one time division multiple access (TDMA) time slot or sub-time slot. The burst is composed of data bit fields 20 and 22 and of a training sequence 21 between them in the middle of the burst, as illustrated in Figure 2. The training sequence 21 is a predetermined bit sequence that is stored in the

10   memory of a receiver such that a training sequence of the received signal can be compared with the stored training sequence. The training sequence 21 can be used for synchronizing the reception and for identifying the received signal, for example. Differential coding generates modulating symbols from pairs of bits in a burst. A carrier which is modulated by control of symbols is amplified

15   in a transmitter and transmitted onto a radio path.

The modulation is the above-described $\pi/4$-DQPSK ($\pi/4$-shifted, Differential Quaternary Phase Shift Keying) modulation. This modulation method comprises eight phase states but only four phase shifts. The allowed phase shifts (symbols) are $\pm\pi/4$ and $\pm 3\pi/4$. In practice, the $\pi/4$-DQPSK constellation

20   thus varies at symbol intervals between two 4-point constellations.

Figure 1 shows a block diagram of a receiver structure of the invention for the TETRA system, for instance. Only the parts of the receiver that are relevant to the understanding of the invention are shown. In reception, a signal is received from an antenna (not shown) and the signal is first processed by

25   radio-frequency parts (not shown). Thereafter, A/D converters (not shown) take samples from the intermediate frequency signal. The samples are supplied to a synchronizing block 100, as illustrated by signal IN in Figure 1. The synchronizing block 100 searches the obtained samples for a training sequence 21 belonging to the frame structure. Thereby the synchronizing block

30   is able to accurately determine an ideal sampling moment, i.e. positions of all symbols in a sample stream. This is also known as symbol synchronization. It is carried out by calculating a complex cross-correlation between the training sequence 21 of the received signal burst and the stored training sequence at different sampling moments. Generally, cross-correlation refers to an integral

35   of the product of two signals, which indicates how well the signals correspond. Thus, the sampling moment of the received signal producing the maximum

cross-correlation value is the ideal sampling moment and synchronization is
carried out accordingly in a known manner. In the described example in con-
nection with the TETRA system, the cross-correlation to be calculated is com-
plex, since the signal IN is a complex signal. The synchronizing block 100 also
5   controls the radio-frequency parts of the receiver in order that the signal arriv-
ing in the A/D converter would stay at an optimal level.

According to the basic idea of the invention, correlation data ob-
tained from synchronization 100 is utilized in assessing a detector type 103A
or 103B required by the radio channel conditions. Thus, the maximum of the
10   cross-correlation result obtained from synchronization 100 corresponds to the
ideal synchronization point, as described above. In an ideal case, when there
is no interference on the radio path, the cross-correlation zero points are lo-
cated before and after the ideal synchronization point, at a distance of a sym-
bol sequence. In other words, when a sampling point is shifted for one symbol
15   sequence forwards or backwards from the ideal sampling point and a cross-
correlation between the obtained training sequence and the stored training
sequence is calculated, the result is zero in the ideal case. However, if multi-
path propagation appears in the radio channel, values deviating from zero, i.e.
power, starts appearing at these cross-correlation zero points. In this specifica-
20   tion, the term cross-correlation zero point refers to the above-described cross-
correlation determined at the distance of one symbol sequence from the
maximum of the cross-correlation, which, in the ideal case, when there is no
interference on the radio path, gives a result of zero, but which is not neces-
sarily zero if interference occurs.
25   It is typical of the radio path that the transmitted signal arrives in the
receiver over several propagation paths, each of which having a specific time
delay, and in addition, the channel properties change as a function of time. For
instance, beams reflected and delayed on the radio path generate intersymbol
interference (ISI). The frequency response or the impulse response of the
30   channel can be estimated by a discrete-time filter, i.e. a channel estimator,
whose tap coefficients model the radio channel. The aim is to describe the
state of the radio channel by a channel estimate. In the present specification,
the channel estimator generally refers to a mechanism that estimates and
maintains a description of the complex impulse response of the radio channel.
35   A method by which the channel estimate is updated is substantially associated
with this mechanism. In the TETRA system, a least mean square (LMS) algo-

rithm, for instance, can be used for updating the channel estimates. In order to ensure that the LMS algorithm is converged before the start of the actual information bits, the detector 103A or 103B must obtain the best possible initial estimate of the state of the channel. This estimate is obtained from the syn-
5   chronization 100 which calculates a complex cross-correlation between the training sequence 21 of the received signal and the stored version of the training sequence when searching an optimal sampling moment. The cross-correlation result provides an initial value for the channel estimate, the initial value indicating an average state of the channel during the training sequence.
10   Channel correction and symbol detection will not begin until the training sequence is received. This ensures that the symbol synchronization is able to adjust the timing of symbols as accurately as possible and to generate the initial estimate of the channel. The channel correction both in the forward direction and in the backward direction preferably proceeds such that, after initializ-
15   ing the estimates, the detector 103A or 103B is trained over the training sequence 21 towards the end of the burst or towards the beginning of the burst, respectively. Consequently, if multipath propagation occurs considerably, it is more preferable to use a detector provided with a channel equalizer, and on the other hand, if multipath propagation does not occur, a conventional differ-
20   ential detector, for instance, can be used as the detector.

       The synchronizing block 100 supplies the received signal frame to a selector unit 102 which selects the detector 103A or 103B to be used on the basis of the correlation data and forwards the frame to the selected detector block 103A or 103B via an output A or B. The detector 103A or 103B detects
25   the information bits and the optional channel equalizer associated therewith corrects non-idealities caused by the radio channel in a known manner, as described above. Finally, in framing 104, the frame is formed into a logical channel that is forwarded for further processing OUT.

       According to a preferred embodiment of the invention, in synchroni-
30   zation 100, the complex cross-correlation between the training sequence 21 of the received signal and the stored training sequence at one zero point or both of the zero points of the cross-correlation is determined as defined above. If the cross-correlation is calculated at either zero point, it is possible to calculate an average of the two obtained values or they can be summed, whereby one
35   cross-correlation value is obtained. Alternatively, it is also possible to use two, separate cross-correlation values in further processing. By means of the abso-

lute value(s) of the obtained cross-correlation, the detector 103A or 103B to be used for symbol detection is selected with the selector 102. One of the equalizers, e.g. 103A, preferably comprises a channel equalizer, and consequently, if the absolute value of the determined complex cross-correlation exceeds a

5   given preset limit value, the detector 103A provided with the channel equalizer is used, and if the absolute value of the determined complex cross-correlation is below a given preset limit value, the other detector 103B, which is e.g. a differential detector, is used. There may be more than two detector types and they may differ from the above-described detectors without that it has any

10   relevance to the basic idea of the invention. Preferably, only the detector 103A or 103B that is used for detection is in operation, which minimizes the computational power required for detection.

Further, according to the preferred embodiment of the invention, the selection of the detector 103A or 103B is carried out by averaging the cross-

15   correlation values of a plurality of received time slots. This can be done by means of an averager 101 which receives the correlation data from the synchronization 100, as illustrated in Figure 1. The calculated average data, on the basis of which the selection of detector is performed, is thus applied to the selector 102. The average is calculated, for instance, after each received burst

20   for a given number of preceding bursts. The selection 102 of the detector is performed e.g. by comparing the average with a predetermined limit value as is described in the above.

For ease of understanding the invention, one example of the general structure of the receiver is described in the above. However, the structure

25   of the receiver may vary without deviating from the present invention. It is obvious to the person skilled in the art that as technology progresses the basic idea of the invention can be implemented in a variety of ways. Thus, the invention and its embodiments are not restricted to the above-described examples, but they may vary within the scope of the claims.

30

CLAIMS

1. A method for selecting a modulation detector in a receiver which comprises at least a first and a second detector, the method comprising the steps of

5   determining at least one cross-correlation value between a stored training sequence and at least one training sequence of a received signal, **characterized** by

selecting a detector used for detecting a signal to be received on the basis of the determined at least one cross-correlation value.

10   2. A method as claimed in claim 1, **characterized** in that the step of determining at least one cross-correlation value comprises the steps of

searching an ideal synchronization point of the received signal, at which point the cross-correlation between the training sequence of the received signal and the stored training sequence has the maximum value, and

15   calculating the cross-correlation value between the stored training sequence and the training sequence of the received signal, which is obtained by shifting the synchronization point of the received signal for one symbol sequence forwards from the ideal synchronization point, and/or

       -    calculating the cross-correlation value between the stored training

20   sequence and the training sequence of the received signal, which is obtained by shifting the synchronization point of the received signal for one symbol sequence backwards from the ideal synchronization point.

3. A method as claimed in claim 1 or 2, **characterized** in that the received signal is a complex signal, whereby at least one cross-

25   correlation value to be determined is a complex cross-correlation value.

4. A method as claimed in claim 3, **characterized** by

performing the step of determining at least one cross-correlation value for a given number of training sequences of the received signal,

            calculating an absolute value of the average of the determined

30   cross-correlation values, and

selecting the first detector for the detection of the signal to be received if the absolute value of the average of the cross-correlation values exceeds a preset limit value, and the second detector if the absolute value of the average of the cross-correlation values is below a preset limit value.

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5. A method as claimed in claim 3 or 4, **c h a r a c t e r i z e d** in that the first detector includes a channel equalizer.

6. A receiver which comprises

a first (103A) and a second (103B) modulation detector,

5   means (100) for determining at least one cross-correlation value between at least one training sequence (21) of a received signal (IN) and a stored training sequence, **c h a r a c t e r i z e d** in that the receiver further comprises

means (102) for selecting the detector (103A, 103B) used for the

10 detection of the signal to be received in response to the determined at least one cross-correlation value.

7. A receiver as claimed in claim 6, **c h a r a c t e r i z e d** in that the means (100) for determining at least one cross-correlation value are arranged

to search an ideal synchronization point of the received signal (IN),

15 at which point the cross-correlation between the training sequence (21) of the received signal and the stored training sequence has the maximum value, and

to calculate the cross-correlation value between the stored training sequence and the training sequence of the received signal, which is obtained by shifting the synchronization point of the received signal for one symbol se-

20 quence forwards from the ideal synchronization point, and/or

to calculate the cross-correlation value between the stored training sequence and the training sequence of the received signal, which is obtained by shifting the synchronization point of the received signal for one symbol sequence backwards from the ideal synchronization point.

25 8. A receiver as claimed in claim 6 or 7, **c h a r a c t e r i z e d** in that the received signal (IN) is a complex signal, whereby at least one cross-correlation value to be determined is a complex cross-correlation value.

9 A receiver as claimed in claim 8, **c h a r a c t e r i z e d** by further comprising means (101) that are arranged

30 to collect a predetermined number of cross-correlation values determined from the training sequences of the received signal and

to calculate an absolute value of the average of the determined cross-correlation values, whereby the means (102) for selecting the detector are arranged

35 to select the first detector (103A) for the detection of the signal to be received if the absolute value of the average of the cross-correlation values

exceeds a preset limit value, and the second detector (103B) if the absolute value of the average of the cross-correlation values is below a preset limit value.

     10. A receiver as claimed in claim 8 or 9, **c h a r a c t e r i z e d** in that the first detector (103A) includes a channel equalizer.

1/1

Fig. 1

IN → SYNCHRO-NIZING (100) → SELECTOR (102) A → DETECTOR1 (103A) → FRAMING (104) → OUT
                                        B → DETECTOR2 (103B) →

CORRE-LATION DATA

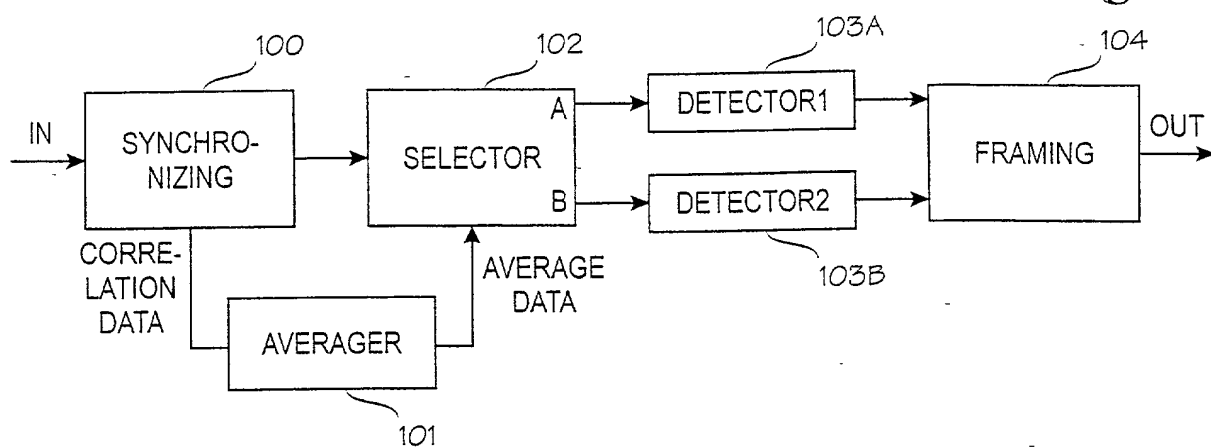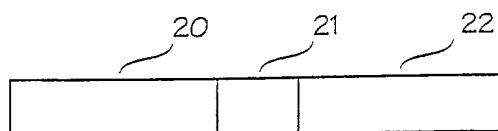AVERAGER (101) → AVERAGE DATA

Fig. 2

20   21   22

2770163

FOR UTILITY/DESIGN
CIP/PCT NATIONAL/PLANT
ORIGINAL/SUBSTITUTE/SUPPLEMENTAL
DECLARATIONS

RULE 63 (37 C.F.R. 1.63)
DECLARATION AND POWER OF ATTORNEY
FOR PATENT APPLICATION
IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

As a below named inventor, I hereby declare that my residence, post office address and citizenship are as stated below next to my name, and I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the **INVENTION ENTITLED** _____
Method for selecting modulation detector in receiver, and receiver

the specification of which (<u>CHECK</u> applicable <u>BOX(ES)</u>)

X   A. ☐ is attached hereto.
BOX(ES)   B. ☐ was filed on _____ as U.S. Application No ____ / _____
→   C. x was filed as PCT International Application No PCT/FI00 /00675 on 9 August 2000
and (if applicable to U.S. or PCT application) was amended on _____

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above. I acknowledge the duty to disclose all information known to me to be material to patentability as defined in 37 C F R 1 56 Except as noted below, I hereby claim foreign priority benefits under 35 U S C 119(a)-(d) or 365(b) of any foreign application(s) for patent or inventor's certificate, or 365(a) of any PCT International Application which designated at least one other country than the United States, listed below and have also identified below any foreign application for patent or inventor's certificate, or PCT International Application, filed by me or my assignee disclosing the subject matter claimed in this application and having a filing date (1) before that of the application on which priority is claimed, or (2) if no priority claimed, before the filing date of this application

PRIOR FOREIGN APPLICATION(S)

Number	Country	Day/MONTH/Year Filed	Date first Laid-open or Published	Date Patented or Granted	Priority NOT Claimed
19991696	Finland	10 August 1999			

If more prior foreign applications, X box *at bottom* and continue on attached page.
Except as noted below, I hereby claim domestic priority benefit under 35 U S C 119(e) or 120 and/or 365(c) of the indicated United States applications listed below and PCT international applications listed above or below and, if this is a continuation-in-part (CIP) application, insofar as the subject matter disclosed and claimed in this application is in addition to that disclosed in such prior applications, I acknowledge the duty to disclose all information known to me to be material to patentability as defined in 37 C F R 1 56 which became available between the filing date of each such prior application and the national or PCT international filing date of this application

PRIOR U.S. PROVISIONAL, NONPROVISIONAL AND/OR PCT APPLICATION(S)

Application No. (series code/serial no.)	Day/MONTH/Year Filed	Status pending, abandoned, patented	Priority NOT Claimed

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

And I hereby appoint Pillsbury Winthrop LLP, Intellectual Property Group, 1100 New York Avenue, N W , Ninth Floor, East Tower, Washington, D C 20005-3918, telephone number (202) 861-3000 (to whom all communications are to be directed), and the below-named persons (of the same address) individually and collectively my attorneys to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith and with the resulting patent, and I hereby authorize them to delete names/numbers below of persons no longer with their firm and to act and rely on instructions from and communicate directly with the person/assignee/attorney/firm/ organization who/which first sends/sent this case to them and by whom/which I hereby declare that I have consented after full disclosure to be represented unless/until I instruct the above Firm and/or a below attorney in writing to the contrary

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George M. Sirilla	18221	Lynn E. Eccleston	35861	Michael R Dzwonczyk	36787		
Donald J. Bird	25323	Timothy J. Klima	34852	W. Patrick Bengtsson	32456		
Peter W. Gowdey	25872	David A. Jakopin	32995	Jack S. Barufka	37087		
Dale S. Lazar	28872	Mark G. Paulson	30793	Adam R. Hess	41835		

(1) **INVENTOR'S SIGNATURE:** _Mikko Huttunen_   Date: 8.3. 2001

Mikko		Huttunen
First	Middle Initial	Family Name

Residence	Espoo	Finland	Finland
	City	State/Foreign Country	Country of Citizenship

Mailing Address (include Zip Code)	Teirintie 9 D 8, FIN-02770 Espoo, Finland

(2) **INVENTOR'S SIGNATURE:** _____   Date: _____

First	Middle Initial	Family Name

Residence			
	City	State/Foreign Country	Country of Citizenship

Mailing Address (include Zip Code)	

"X" box ☐ FOR ADDITIONAL INVENTORS, and proceed on the attached page to list each additional inventor.
☐ See additional foreign priorities on attached page (incorporated herein by reference).
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